B1 matrix comprising passages, with a narrowing of the guide at the level of the separation of the parts, and the parts of the guide are separated while the alloy is in the liquid state.

B2 13. (Amended) A guide for the making of balls or solder connection pads directly on electrically conductive connection-receiving zones of an electric component, the guide being designed to contain a conductive liquid alloy and being open at one end, wherein the guide is formed by two separable parts comprising passages with a narrowing of the guide at the level of the separation of the parts, and wherein the parts are designed to ensure a break of the solder between the two parts of the guide at the time of their separation.

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-28 are presently pending in this application, Claims 1 and 13 having been amended by the present amendment.

In the outstanding Office Action, Claims 1-3, 13-17 and 22-24 were rejected under 35 U.S.C. 102(b) as being anticipated by Gruber (U.S. Patent 5,673,846); Claims 1-4, 7, 9, 12-15 and 22 were rejected under 35 U.S.C. 102(b) as being anticipated by Ference et al. (U.S. Patent 5,244,143); Claims 13-15, 18, 21, 22, 25 and 28 were rejected under 35 U.S.C. 102(b) as being anticipated by Cordes et al. (U.S. Patent 6,105,852); Claims 4-9 were rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber (U.S.Patent 5,673,846) in view of Ference et al. (U.S. Patent 5,244,143); Claim 10 was rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber (U.S.Patent 5,673,846) in view of Ference et al. (U.S.Patent 5,244,143) as applied to claims 9 above and further in view of Covell, II et al. (U.S. Patent 5,718,367); Claim 12 was rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber

(U.S.Patent 5,673,846) in view of Covell, II et al (U.S. Patent 5,718,367); and Claims 11, 19, 20, 26 and 27 were objected to as being dependent upon a rejected base claim.

The amended Claims 1 and 13 are fully supported by the specification, drawings and claims as originally filed.[1] Applicant therefore submits that no new matter has been introduced.

Briefly recapitulating, Claim 1 is directed to a method for making balls or solder connection pads directly on an electrically conductive connection-receiving zone of an electric component. For example, referring to the non-limiting embodiment of Figs.1 and 6-10, the method includes an operation for the injection of conductive liquid alloy into a guide open at one end placed so as to face the connection-receiving zone of the component. The guide 10 is formed by two separable parts, a mold 16 and an injection matrix 18. The mold 16 and the injection matrix 18 include passages (28 and 30), with a narrowing of the guide at the level of the separation of the parts. The parts of the guide are separated while the alloy is in the liquid state.

The present invention recited in Claim 1 is directed to a method for making balls ***directly*** on an electric component. The present invention is not related to ***indirect methods***, which involve for example the making of a transfer carrier ("solder decal strip") that carries solidified solder balls, and then the transfer of these solder balls on the electric component by contacting and heating ("remelting").

On the contrary, the present invention is directed to a method involving an injection of molten solder directly onto the electric component through a guide formed by two separable parts (a mold and a matrix) with a narrowing at the level of the separation of the parts.

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[1]For example, Figs. 1 and 6-10.

Further, according to the present invention, the parts of the guide, i.e., the mold and the injection matrix, are separated ***while the alloy is in the liquid state***. The combination of this separation in liquid state and a narrowing of the guide at the level of the separation of the parts allows to precisely dissociate the solder entrapped in the mold from the rest of the solder without the need of additional means (air knife, wiping or the like). This also allows a quick making of the solder balls onto the component.

The Office Action asserts that Gruber discloses a method of making solder balls or pads on an electric component, the method including the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold (16) and an injection matrix (12) comprising passages with a narrowing of the guide (upper portion of section 18) at the level of separation of the parts. The Office Action further asserts that Gruber discloses that the matrix is separated from the mold while the alloy is still liquid.[2]

However, Gruber is directed to an ***indirect*** method of making solder balls on an electric component. Gruber discloses a method of making balls 26 on a decal strip 12 (see in particular Fig.2). Gruber does not teach a method for making balls ***directly*** on the electric component with a unique operation of deposition.

More specifically, the Gruber method includes two main deposition steps (see Fig. 1):

I - a step of making a decal strip, by providing a transfer strip with solder balls; and

II - a step of transferring the balls from the decal strip to the electric component.

Step I includes injecting solder into the cavities 18 of a mold 16 as well as in the anchor holes 14 of a decal strip 12 which is placed so as to be in contact and in fluid communication with said mold (see Fig. 1).

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[2]The outstanding Office Action, page 2, line 10 from the last line to line 4 from the last line.

Supposed that the mold 16 and the decal strip 12 disclosed in Gruber correspond respectively to the mold and the injection matrix recited in Claim 1, then Gruber **does not disclose "an injection of conductive liquid alloy into a guide open at one end placed so as to face the connection-receiving zone of the component"**.

In Gruber, the opening 14 of the "mold" 12 is only placed so as to face a backing plate 20 (see col. 2, line 62 and Fig. 1).

In addition, it is expressly stated in Gruber (see for example col.3, lines 11-15) that during step (b) shown in Figure 1B, the "mold" 12 and the "injection matrix" 14 "are filled with the liquid solder 24a which is then allowed to cool therein to solidify the solder 24a to form solidified solder bumps ..." The separation of "mold" 12 and "matrix injection" 14 only occurs during step (c), that is to say ***after the solidification*** of the solder (see col. 3, line 15).

Therefore, Gruber is not believed to in any way to anticipate the specific features recited in Claim 1.

The Office Action further asserts that Ference et al. disclose a method of making solder balls or pads on an electric component, the method including the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold 32 and an injection matrix 34 comprising passages (60, 66, 68) with a narrowing of the guide (upper portion of section 68) at the level of separation of the parts. The Office Action further asserts that Ference et al. disclose that the matrix is separated from the mold while the alloy is still liquid.[3]

However, Ference et al. is directed to a method for making balls on an electric component including an operation for the injection of liquid alloy into a guide open at one

[3]The outstanding Office Action, page 3, lines 9-16.

end placed so as to face the connection-receiving zone of the component 50. The guide is formed by two separable parts, namely a mold 32 and an injection plate 34 (see Fig. 4).

After the injection, the liquid alloy in the mold is separated from the rest of the liquid alloy by wiping. The wiping is operated by a lateral movement of the injection plate 34 (see col. 6, lines 51-63). ***During the wiping, the injection plate 34 is not separated from the mold 32.***

In another embodiment, the injection plate 34 and the mold 32 may remain fixed, and the separation of the alloy is obtained with wiping or shearing means (see col. 7, lines 54-56).

Therefore, Ference et al. does not disclose a separation of the alloy by separating the mold and the injection matrix while the alloy is still liquid. Instead of separating the mold and the matrix, Ference et al. proposes a relative movement of the mold and the matrix. This movement is not a separation.

In addition, even if, in Ference et al., the mold is separated from the matrix, this separation occurs only ***after the solder solidifies in the mold 32.***

Indeed, Ference et al. clearly states that:

- the "apparatus is cooled so the solder solidifies in shapes determined by the cavities 68 of mold 32" (cf. col. 7, lines 5-8 and Figs. 8 and 11);
- and then that "injection plate 34 is lifted up" (cf. col. 7, line 9 and Fig. 12).

Therefore, Ference et al. is not believed to in any way to anticipate the specific features recited in Claim 1. Thus, Claim 1 is believed to be allowable.

Substantially the same arguments as set forth above with regard to Claim 1 also apply to dependent Claims 2-12, which depend directly or indirectly from Claim 1, respectively. Further, Claim 11 was indicated as including allowable subject matter. Accordingly, each of the dependent claims is also believed to be allowable.

Claim 13 is directed to a guide for the making of balls or solder connection pads directly on electrically conductive connection-receiving zones of an electric component. The guide is designed to contain a conductive liquid alloy and is open at one end. The guide is formed by two separable parts including passages with a narrowing of the guide at the level of the separation of the parts. The parts are designed to ensure a break of the solder between the two parts of the guide at the time of their separation.

The Office Action asserts that Cordes et al. disclose a guide for making solder balls or pads on an electric component the guide including a mold 21 and an injection matrix 28.[4]

However, Cordes et al. does not disclose a method for making balls directly on the electric component with a unique operation of deposition. Instead, Cordes et al. discloses an ***indirect*** method of making solder balls on an electric component. Cordes et al. discloses a method of making balls 3 on a decal strip 21.

More specifically, Cordes et al. method includes two main deposition steps:

I - a step of making a decal strip, by providing a carrier with solder balls (cf. Figure 2); and

II - a step of transferring the balls from the decal strip to the electric component 1 (cf. Fig. 4 and col.4, lines 21-37).

Step I includes injecting solder into the cavities 24 of a decal strip 21 which is placed so as to be in contact and in fluid communication with a "matrix" 19 (cf. Fig. 2).

Supposed that the decal strip 12 disclosed in Cordes et al. corresponds to the mold recited in Claim 13, then Cordes et al. **does not disclose "an injection of conductive liquid alloy into a guide open at one end placed so as to face the connection-receiving zone of the component".**

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[4]The outstanding Office Action, page 4, lines 14-18.

Cordes et al. only discloses the filling of cavities 24 with molten solder, and then the solidification of said solder in said cavities 24, in order to have a decal strip provided with solidified balls.

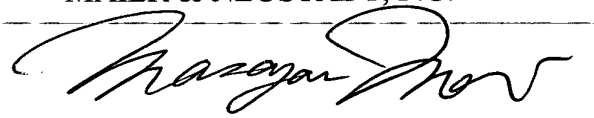
Although the examiner considers that part 28 is an "injection matrix", Cordes et al. clearly states that part 28 is a "removable chemical etch resistant capability layer", intended for conducting the making of cavities 24 by chemical etching (cf. col.3, lines 62-67). Therefore, layer 28 and opening 31 do not mechanically perform the function claimed in the invention. Therefore, Cordes et al. is not believed to in any way to anticipate the specific features recited in Claim 13. Further, Gruber is not believed to in any way to anticipate the specific features recited in Claim 13. Thus, Claim 13 is believed to be allowable.

Substantially the same arguments as set forth above with regard to Claim 13 also apply to dependent Claims 14-28, which depend directly or indirectly from Claim 13, respectively. Further, Claims 19, 20, 26 and 27 were indicated as including allowable subject matter. Accordingly, each of the dependent claims is also believed to be allowable.

Consequently, in view of the amendments and in view of the indication of allowable subject matter, Applicant respectfully submits that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



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IN THE CLAIMS

Please amend Claims 1 and 13 as follows:

--1. ~~(Amended) A method for making balls or solder connection pads~~ directly on an electrically conductive connection-receiving zone of an electric component, the method comprising an operation for the injection of conductive liquid alloy into a guide open at one end placed so as to face the connection-receiving zone of the component, wherein the guide is formed by two separable parts, a mold and an injection matrix, the mold and the injection matrix comprising passages, with a narrowing of the guide at the level of the separation of the parts, and the parts of the guide are separated while the alloy is in the liquid state.

13. (Amended) A guide for the making of balls or solder connection pads directly on electrically conductive connection-receiving zones of an electric component, the guide being designed to contain a conductive liquid alloy and being open at one end, wherein [it] the guide is formed by two separable parts comprising passages with a narrowing of the guide at the level of the separation of the parts, and wherein the parts are designed to ensure a break of the solder between the two parts of the guide at the time of their separation.--